

Claims

1. A clamping table (1) for workpieces (8) in a machine tool, comprising a plurality of mutually juxtaposed clamping elements (3) which each have a respective telescopic tube unit (10) with a top-end suction plate (11), wherein the concentric tubes (13, 14) of the telescopic tube unit (10) are displaceable relative to each other by a positioning drive (12),

characterised in that the positioning drive (12) is arranged coaxially with respect to the telescopic tube unit (10) and is releasably coupled to the displaceable telescopic tube (13) by means of a positively locking plug coupling (21, 25).

2. A clamping table (1) for workpieces (8) in a machine tool, comprising a plurality of mutually juxtaposed clamping elements (3) which each have a respective telescopic tube unit (10) with a top-end suction plate (11), wherein the concentric tubes (13, 14) of the telescopic tube unit (10) are displaceable relative to each other by a positioning drive (12),

characterised in that the positioning drive (12) is arranged coaxially on the telescopic tube unit (10) and is permanently coupled to the displaceable telescopic tube (13) and is connected electrically to a power supply (53) by means of a releasable plug connection (50, 52).

3. A clamping table according to claim 2 characterised in that the plug connection (50, 52) also forms a mechanical centring means.

4. A clamping table according to claim 1 or claim characterised in that the positioning drive (12) is a stepping motor co-operating with a central spindle transmission (17, 18) in the telescopic unit (10).

5. A clamping table according to one of claims 1 to 4 characterised in that the telescopic units (10) are each fixed with their suction plate (11) and their coupling or electrical connecting partner (25; 50) in the transverse members (2) which extend over the table by plugging in the outer telescopic tube (13) therein and the plug coupling (21, 25) and the connection (50, 52) respectively is closed in the fixing position.

6. A clamping table according to claim 5 characterised in that positioning drives (12) besides the respective coupling partner (25) and electrical connecting partner (50) are each also arranged in transverse members (4; 51) which extend parallel to the transverse members (2) of the telescopic units (10).

7. A clamping table according to claim 5 characterised in that the transverse members (2) of the telescopic units (10) comprise hollow profile members having a plurality of parallel walls (40, 41) which form air guide passages (42, 43) and which are pierced by stepped bores for receiving the telescopic units (10), wherein annular seals (44) arranged on same seal off in relation to the walls (40, 41), axially displaced portions of the outer telescopic tube (13), in which there are provided radial access bores (36; 46).

8. A clamping element for a clamping table according to claim 1 characterised in that the plug coupling (21, 25) comprises at least one central transverse groove (22) in the one coupling partner (21) and a blade (24) engaging thereinto on the other coupling partner (25), wherein the blade sits on a cuff which is guided displaceably perpendicularly to the blade in a base portion of the other coupling partner (25).

9. A clamping element according to claim 8 characterised in that two transverse grooves (22) are arranged in mutually perpendicularly relationship in a coupling partner (21).

10. A clamping element according to claim 8 or claim 9 characterised in that the edges of the transverse groove or grooves (22) are provided with inclined insertion faces (23).

11. A clamping element for a clamping table according to one of claims 5 to 7 characterised in that the a suction air path passes from an access bore (46) in the outer telescopic tube (13) through the annular space between the tubes (13, 14) to an inlet bore (48) in the inner telescopic tube (14), the internal space of which is in communication with

the suction plate (11), wherein a seal (30) in relation to the inner telescopic tube (14) is arranged with axial displacement towards the coupling (21, 25) in the inside wall of the outer telescopic tube (13), which seal (30) is between the access bore (46) and the inlet bore (48) only in the completely retracted condition of the inner telescopic tube and a subsequent short extension region.

12. A clamping table according to one of claims 1 to 7 with clamping elements according to claim 11 characterised by a workpiece feed plane which is defined by the surfaces of supports (5) and which in the completely retracted condition of the inner telescopic tube (14) is above the suction plate top sides but within the short extension region of the inner telescopic tube (14).

13. A clamping table according to claim 12 characterised in that the support surfaces are formed by balls (6) rotatable in all directions.

14. A clamping element for a clamping table, in particular according to one of claims 1 to 13, characterised in that an annular cuff (33) is fixed in the stationary (outer) telescopic tube (13) of the telescopic tube unit (10) near its end remote from the coupling, wherein the space (35) between the cuff and the inside wall of the stationary telescopic tube (13) can be acted upon by compressed air in order clampingly to arrest the movable (inner) telescopic tube (14) by pressing the cuff (33) against the movable telescopic tube.

15. A clamping element according to claim 14 characterised in that the thin-wall cuff (33) comprises plastic material integrally with spaced fixing and sealing rings (34).

16. A method of operating a clamping table according to claim 12 characterised in that the workpiece (8) to be clamped is laid with lateral alignment on the supports (5), thereupon the clamping elements (3) which are selected in programmed fashion are extended against the workpiece (8) and lift the workpiece to beyond the short extension region

so that reduced pressure passes through the suction air path (46, 48) to the suction plates (3) forming the interrupted workpiece support surface and the workpiece (8) is clamped fast, and finally those activated clamping elements (3) are further extended into a working position.

17. A method of calibrating a machine tool having a clamping table (1) according to claim 1 or claim 2 and a tool head (62) which is displaceable under NC control over all clamping elements (3) in a defined plane,

characterised in that each clamping element (3) is moved towards the tool head (62) or a measuring bar accommodated therein and the respective number of steps of the stepping motor (12) which are required for that purpose for forming a workpiece support plane in parallel relationship with the defined plane is fed into the control system.